

Boulder Amateur Television Club TV Repeater's REPEATER

October, 2023
issue #143

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com



Jim Andrews, KH6HTV, editor - kh6htv@arri.net www.kh6htv.com

Remote 70cm Receive Sites for W0BTV - DVB-T Repeater

Our readers no doubt have been following Boulder's RFI problem with our W0BTV, DATV repeater. Recently, we have been plagued with extremely severe, broad-band noise RFI on our 70cm input receivers. While the receivers have good sensitivity of better than -90dBm, an incoming signal needs to be greater than -60dBm to override the RFI. Fortunately, our primary, co-ordinated input frequency on the 23cm band is free of RFI. We have finally thrown up our hands in resignation and have decided we must simply live with the 70cm RFI. If it is coming from the repeater site's owner, the government agency and some of their electronic emissions, then we certainly have no grounds to complain. We have to live with it.

So, how do we support our local ARES group's mission to supply ATV coverage of emergency events to the local public safety organizations? All of BCARES' ATV gear operates on the 70cm band. Well, our co-trustee, Don, N0YE, recently made the suggestion -- "**Why not have a network of remote 70cm receive sites?**"

How can we implement this suggestion? Where would they be located?

Perfect solution would be for our present existing network of ATVers to in fact also be our remote receive sites. Some of us also have QTH locations on high ground with great RF coverage of various

portions of Boulder County. Plus, we all have line-of-sight views to our W0BTV repeater on the mesa south-west of the City of Boulder.

So what is involved ? The simplest solution is for each participating ATVer to do a minor rewiring of his/her setup whenever it is not being actively used. Move your 70cm receiver's frequency from the repeater at 423 MHz and put it on the 441 MHz input frequency. Patch the HDMI output from your receiver directly to the HDMI input on your 23cm transmitter (set to 1243 MHz). The extra item still required is to bring a logic, "Valid Signal" from the receiver over to the PTT input on the 23cm transmitter's linear power amplifier. In this manner, whenever your receiver sees an incoming DTV signal, it will automatically key up your 23cm transmitter and thus relay it on to the wide area coverage, W0BTV, DATV repeater. In essence, each participating ATVer has his/her own 70cm --> 23cm cross-band, DATV repeater. FCC ID ? That is done automatically for us by our Hi-Des modulators. They automatically send out with the TV frame meta-data our station's call sign.

Most all of the Boulder ATV hams are using KH6HTV Video's rf linear power amplifiers. These amplifiers all have a built-in feature allowing them to be keyed directly with an external PTT logic line. The other item, needed is a receiver with a "Valid Signal" output. The next article in this newsletter discusses how to get such a low cost receiver.

73 de Jim, KH6HTV, W0BTV Trustee

DVB-T Receiver VALID SIGNAL Detector

Jim, KH6HTV

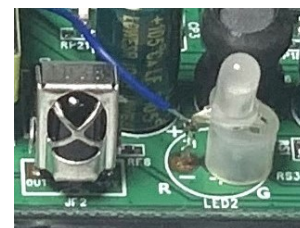
For automatic control of our digital ATV repeaters, we need to be able to have a control signal which tells us when we are receiving a "**Valid DTV Signal**". In the good old, analog ATV days, we got this information by using an audio tone decoder, 555 IC to detect the presence of the 15 kHz horizontal sync pulses. Not so simple now with digital. Fortunately, some of the DTV receivers include a valid signal detector and provide a front panel LED which glows either red (no signal) or green (signal). This makes our task much easier. We simply need to dig into the box and pick off the LED drive voltage with a suitable buffer.

The first trick is to find a suitable receiver with this LED. The Hi-Des receivers do in fact include a "Valid Signal" LED. Back in 2015, when we wanted to build our first DVB-T repeater, we came up with a simple, one transistor buffer circuit to install in the Hi-Des HV-110 receiver. For details, see the KH6HTV Video application note, AN-23. (

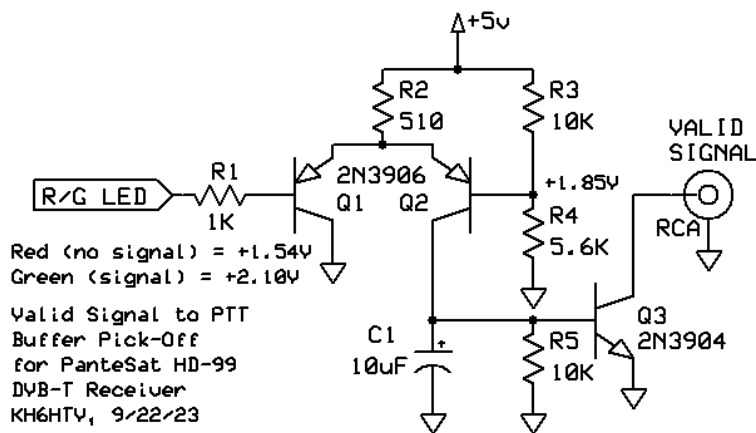


available at www.kh6htv.com). Next along came a combo DVB-T & DVB-S receiver which we all loved. The early version did in fact have a Valid Signal LED. Unfortunately, the current production no longer includes this LED. So a search was on recently for another inexpensive receiver which had the LED. Bob, WB0NRV, found such a receiver. It is the **PanteSat model HD-99**. Depending upon where you buy it, it sells for the ridiculously low price of only \$15 to \$30. The HD-99 is not a "combo", it is only for DVB-T. It comes complete with a built-in AC (115/230Vac) power supply, but it can also be powered externally via a +5Vdc USB connection on the rear panel.

The HD-99's LED was easy to locate. Opening the plastic cabinet, it is located right on the front, next to the IR sensor. Labeled as LED2. Attaching a voltmeter to the exposed wire lead showed the LED voltage there to be +1.54V (red, no signal) and +2.10V (green, signal).



For controlling the RF Linear Power Amplifier in our DATV repeater, we use a PTT (Push To Transmit) logic signal of Zero, pull to ground to key the amplifier on. This is typically achieved using an open collector transistor. So, we need some buffer circuit between the LED and this transistor, Q3. Here is the circuit I came up with. It is a simple, emitter coupled differential amplifier using a pair of 2N3906, PNP transistors. The reference voltage was set to the mid-point of +1.85Vdc. The capacitor, C1, is included to smooth out any rapid on/off switching which might occur with weak signals at the receiver's digital threshold.

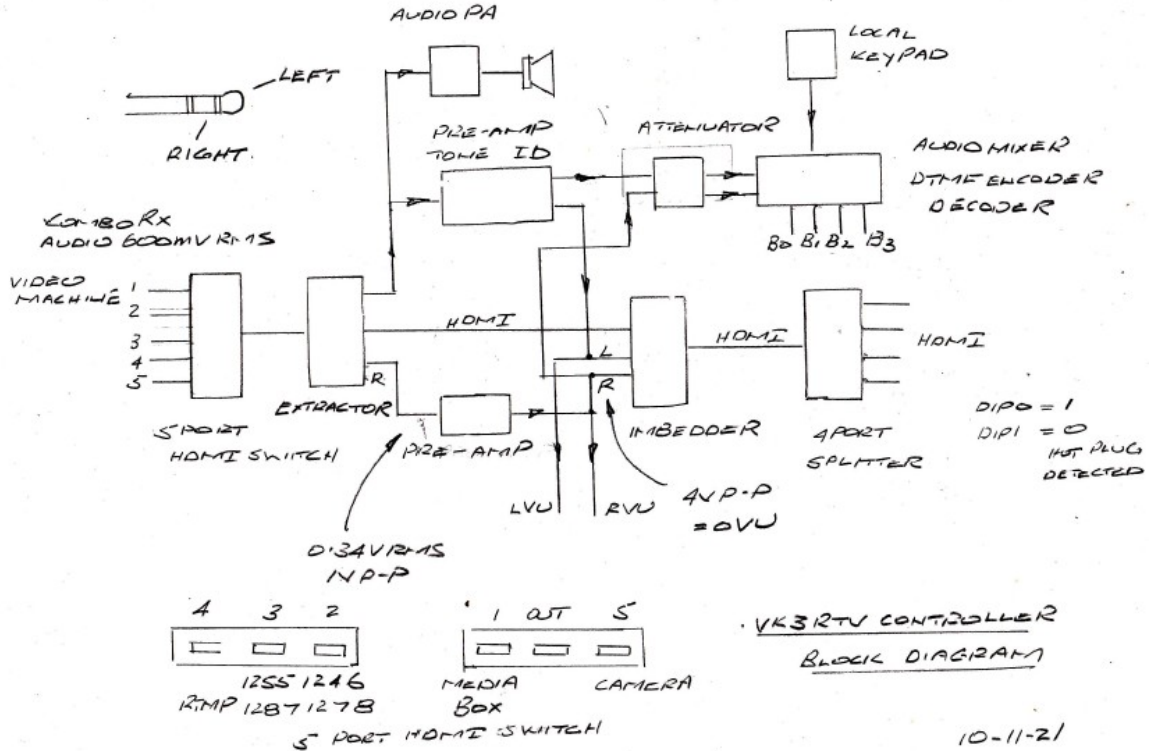


The next trick is how to cram this into the really small HD-99!



I used perf board construction with standard, wire lead components. I wedged the perf board into one of the slots of the heat sink on the main processor IC. I used tiny, wire-wrap wire for the connections.

73 de Jim, KH6HTV, Boulder, Colorado



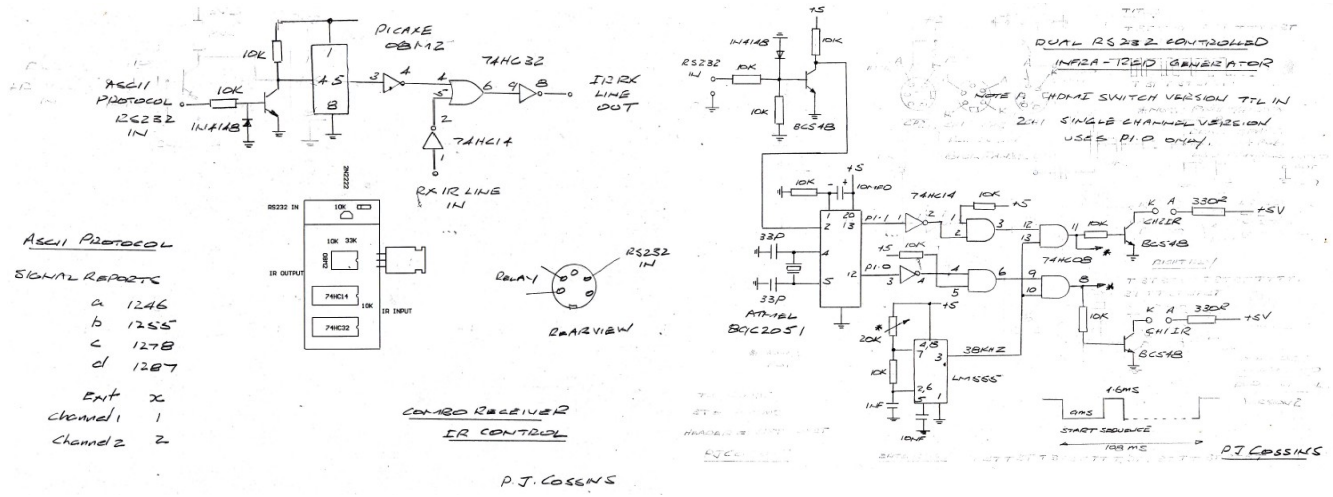
More HDMI Quad Viewer Control Feedback:

Hi Jim .. Great that the Boulder Repeater is back up and running, done in quick time. ! You may publish my email and circuits in the next Newsletter if you like.

I have been using microprocessor generated IR for some time to control domestic appliances for VK3RTV. About 20 – 25 years ago (approx.) I developed it to remotely control a CD Player. I used the same process to control the 5 port HDMI switches that are currently in VK3RTV. In the case of the IR Controller, there are two start pulses in a signal frame followed by a sequence of short and longer pulses. Anyone with a modern Digital CRO can catch these on the output of an IR Decoder and measure the width, number and sequence of the pulses. I simply send a single ASCII Character to the Micro which then in turn generates the IR Code.

I have attached some simple circuit diagrams that I have used. The process will not work unless you mix in the 38 KHz sub-carrier as per the diagrams. Instead of the AND gates you could use just two OR gates. (I probably did not have any at hand at the time). The Picaxe version does not have the 38 KHz subcarrier as the line is the output of the IR decoder in a Combo Receiver.

Originally I used Atmel AT89C2051's as I had a large number left over from a commercial job. (I still have quite a few) Later I used Picaxe 8 pin chips. I note the BATC guys are always keen on Raspberri's Pi's. All good, but a stand alone micro is a lot cheaper and very easy to generate the pulses required.



In our VK3RTV, digital ATV repeater, I control the Combo Receivers the same way. I break the IR line inside the receiver and insert the simple circuit. I can the change channels and bring up the signal report etc.

I have also attached a block diagram of VK3RTV's IR Controlled HDMI Switch and signal processing. I can supply code for an ATMEL 89C2051 (or any 8051 type processor, yep very very old hat but I still have lots of them !!) or Picaxe.

The resultant switching is a bit 'clunky' and takes just a bit of time.... there are RS232 controlled HDMI switches that are commercially available. I have not tried any of those out to compare as the cost for VK3RTV would have been about \$500 for two of them.

Regards Peter, VK3BFG, Melbourne, Australia

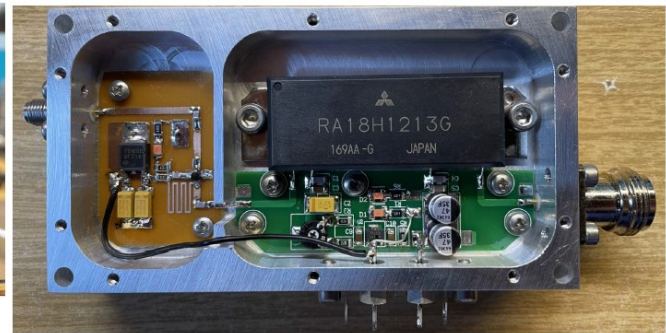
23cm, 22 Watt, DVB-T, Transmitter

Check out the latest, October issue of NEVARC News. (NEVARC = North East Victoria Amateur Radio Club - Australia). Mick, VK3CH, has a very nice article in it detailing his construction of this amplifier. The URL link for the newsletter is:

<https://nevarc.org.au/wp-content/uploads/2023/09/NEVARC-NEWS-Vol-10-Issue-10-2023.pdf>

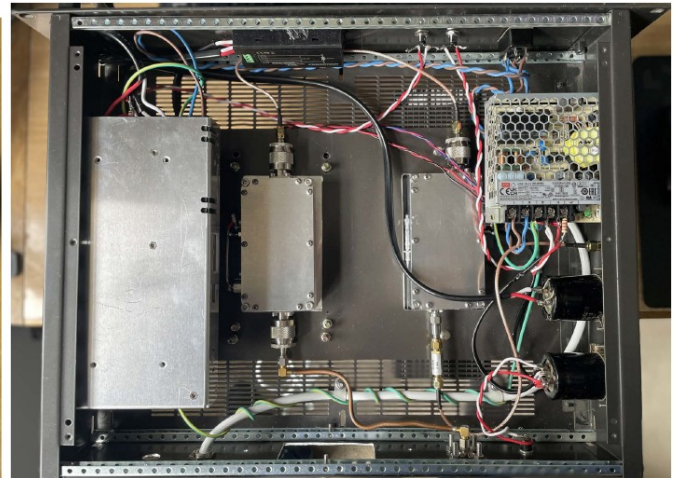
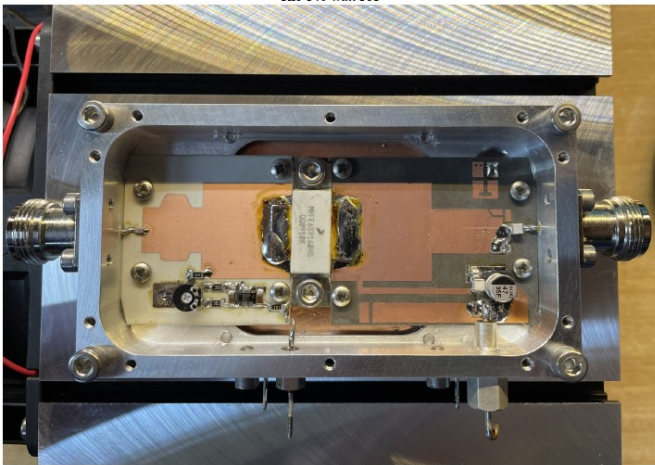
The key building blocks in Mick's amplifier are an MRFE6S9160HS, 140 Watt, high power RF FET, final amplifier and a RA18H1213G, 18 Watt, MMIC brick amp used as the driver amplifier. He purchased these basic modules from Bert, PE1RKI, in Holland (www.pe1rki.com)

Editor's Note: Why only 22 watts from a 140 watt final ? ---- For DVB-T, linearity is a must. Plus, 22 watts is the average power output, not the PEP. The rf waveform looks like noise with lots of peaks and valleys. Clip off the peaks and you will destroy the digital signal's bit error rate. Poof! No detected video. For DVB-T, we have found that we typically need about 8 dB head room between the average and PEP (max. rf output power). Run the math for yourself $10 * \log_{10}(140w/22w) ==> 8dB$



The 3 watt Driver PA

The 140 watt PA



Burt's NEW, high power, 23cm Amplifier

Boulder ARES E.C. & ATVer K0ARK

This month we are high-lighting another of our Boulder ATVers. Meet Allen Bishop, K0ARK. Allen has been very active in Boulder ARES (BCARES) for many years. He is presently the chairman and E.C of BCARES. He has gone far above and beyond the normal ARES hams, as he has also served as a ham ATV tech. on the Boulder County Sheriff's SWAT team since 2008. He is also a certified drone pilot for emergency ops.



Allen - K0ARK

Allen has an impressive ham station as seen in the above photo. He is especially talented in terms of mechanical skills for building ham equipment. Notable accomplishments have included a very impressive, motorized crank-up Rohn antenna tower and Step-IR HF yagi antenna mounted on a trailer. Allen has supplied the main 20 meter HF station for the Boulder ham club's Field Day operations for the past several years with his mobile antenna tower and rig.

The above photo is Allen showing off his latest project. He has packaged as a "Go-Kit" a 70cm ATV transmitter. The items Allen has nicely packed into the rugged case include: Hi-Des, model HV-100, DVB-T Modulator; KH6HTV Video, model 70-7B, 3 Watt, RF Linear Power Amplifier; a rechargeable battery; dc power adapter for camcorder; plus necessary DC wiring, switches, V/A/W meter & HDMI cabling. He also left storage space in the box for the Sony camcorder and a flexible, whip antenna. Very nicely done Allen.



Maui Fire & ARES Feed-Back & ARRL: In our previous issue #141, we featured an editorial entitled "*Where Was ARES for the Maui Fires ?*" Since then we have gotten a lot of feed-back from other hams, all positive. But the ARRL ? --- Yesterday (9/21) I received my October issue of QST in the mail. On page 66, there was a full page article with the head-line "*Hawaii Wildfires Prompted ARES Response*". **Wrong !** It didn't happen. What ARES response ? ? ? The article was simply a repeat of the electronic news bulletin sent out by the ARRL shortly after the fire. Actually reading the article you will not find anything in it about ARES doing anything. The QST headline was what the ARRL had hoped happened -- but it didn't.

Jim, KH6HTV, editor

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WOBTV Details: **Inputs:** 23 cm Primary (CCARC co-ordinated) + 70 cm secondary all digital using European Broadcast TV standard, DVB-T 23cm, 1243 MHz/6 MHz BW (primary), plus 70cm (secondary) on 441 MHz with 2 receivers of 6 & 2 MHz BW
Outputs: 70 cm Primary (CCARC co-ordinated), Channel 57 -- 423 MHz/6 MHz BW, DVB-T Also, secondary analog, NTSC, FM-TV output on 5.905 GHz (24/7 microwave beacon).
Operational details in AN-51c Technical details in AN-53c. Available at:
<https://kh6htv.com/application-notes/>

WOBTV ATV Net: We hold a social ATV net on Thursday afternoon at 3 pm local Mountain time (22:00 UTC). The net typically runs for 1 to 1 1/2 hours. A DVD ham travelogue is usually played for about one hour before and 1/2 hour after the formal net. ATV nets are streamed live using the British Amateur TV Club's server, via: <https://batc.org.uk/live/> Select *ab0my or n0ye*. We use the Boulder ARES (BCARES) 2 meter FM voice repeater for intercom. 146.760 MHz (-600 kHz, 100 Hz PL tone required to access).

Newsletter Details: This is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 500+. News and articles from other ATV groups are welcomed. Permission is granted to re-distribute it and also to re-print articles, as long as you acknowledge the source. All past issues are archived at: <https://kh6htv.com/newsletter/>

ATV HAM ADS

Free advertising space is offered here to ATV hams, ham clubs or ARES groups. List here amateur radio & TV gear For Sale - or - Want to Buy.

Boulder Amateur Radio Club (BARC)
BARCfest Hamfest

Ham Radio and Electronics
Sunday, October 8, 2023, 9 am to 1 pm

Boulder County Fairgrounds -- Exhibit Building
(Just north of the Hover Rd. & Nelson Rd. intersection in Longmont, Colorado)

Admission \$5 – Under 18 Free with Paid Adult
(Correct Change Appreciated to Avoid Delays at Door)

Lots of Great Treasures
Awesome Door Prizes Hourly with
Grand Prize at Noon
(Must be Present to Win)



ARRL V.E. License Testing, 10 am



Pre-registration strongly recommended -- walk-ins possible. Go to BARCfest session at hamstudy.org
Direct registration link: <https://ham.study/sessions/644d313ebb47dd7a44566a04/1>
For questions write to: barc70@arrl.net

Main Hamfest Doors Open to the Public at 9:00 am
Vendor Doors Open for Set-up at 7:30 am

For more information contact write to barc70@arrl.net or call Debbie (WB2DVT) 303-447-3183



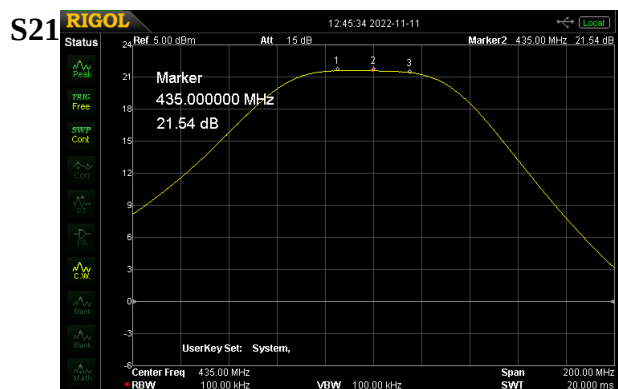
Plus lots of Swap-Fest Door Prizes !

supplied by: Alpha Antenna, Arrow Antenna, Bioenno Power, DERA, DX Engineering, Ham Radio Deluxe Software, N3FJP Software, Heil Sound, The Wireman, & Ham Radio Outlet

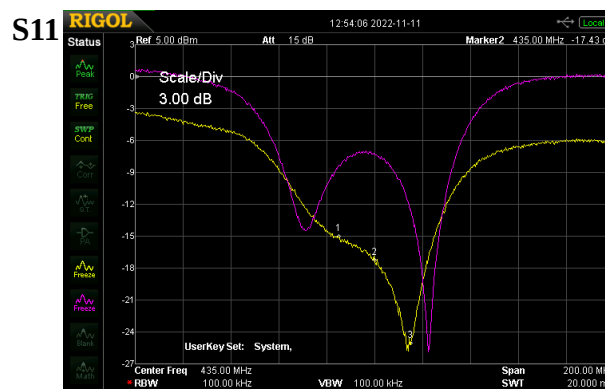


Model 70-LNA 70 cm, 0.8 dB NF Pre-Amplifier

The KH6HTV VIDEO Model 70-LNA is a low noise Pre-Amplifier for the 70 cm (420-450 MHz) amateur radio band. **The noise figure is a low 0.8 dB** with a gain of 20 dB and high output, -1dB gain compression of +21 dBm. This amplifier has decent return loss on both input and output.



Gain: 3 dB/div & 20 MHz/div



(yellow) & S22 (magenta)
3 dB/div & 10 MHz/div

PARAMETER	Typical Performance	Notes
Frequency Range	420-450 MHz	70 cm amateur radio band
Noise Figure	0.8 dB	measured on HP-8970A
Gain, S21	20 dB	
Bandwidths	80 MHz & 135 MHz	-3 dB & -10 dB BW
Max. Output Power	+21 dBm	at -1 dB gain compression
Input Return Loss, S11	> -10 dB	
Output Return Loss, S22	> -10 dB	
DC Supply Voltage	+12 Vdc, nominal at 100 mA	11-15 Vdc range
RF Connectors	SMA (f)	
DC Power Connector	Feed-Thru, By-Pass Capacitor	Optional -- DC feed via RF output
Dimensions	1.5" x 3.6" x 1.25"	fully shielded, die-cast enclosure
Test Report	included	includes S21, S11, S22 & NF

KH6HTV-VIDEO www.kh6htv.com e-mail: kh6htv@arrl.net Boulder, Colorado, USA